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Symbolic Reduction of Block Diagrams Using FORMAC

The problem:

The large complex block diagrams used in controls and dynamics can be very difficult to reduce manually for desired symbolic transfer functions needed for further research or for engineering applications.

The solution:

Two computer programs: one written in FORMAC to generate the desired symbolic expressions and one written in Fortran IV to numerically evaluate the expressions.

How it's done:

The FORMAC program consists of four steps:

(1) symbolic reduction of the system of equations of the block diagram to one equation containing the two variables of the desired transfer function;
(2) solution of this equation for the transfer function in terms of the transfer functions for the blocks;
(3) substitution of the system information for the transfer functions for the blocks;
(4) expansion of this equation and collection of terms of the real and imaginary parts.

The Fortran program accepts the symbolic punched output from the FORMAC program in either unexpanded or expanded form. It numerically evaluates the symbolic expressions. The Laplace operator or driving frequency form is evaluated for particular numerical values of the system parameters involved. Such numerical values as the amplitude ratio and phase angle as functions of driving frequency are computed.

Block diagrams can be handled for any linear constant coefficient system whether it is lumped or distributed parameter as long as an expression for the real and imaginary parts is known.

Notes:

1. This program is written in Fortran IV and FORMAC for use with the IBM 7094 computer with FORMAC compiler.
2. Inquiries concerning this program may be made to:

   COSMIC
   Computer Center
   University of Georgia
   Athens, Georgia 30601
   Reference: B68-10423

Patent status:

No patent action is contemplated by NASA.

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Category 06

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